

Supplementary Materials

ROBUSTNESS CHECK OF COUNTY LEVEL ANALYSES USING ALTERNATIVE DATA SOURCE

Multiple data sources report on daily vaccination rates in Philadelphia County. We use data from the Centers for Disease Prevention and Control (CDC) (1) as our primary data source in our main analyses because it was 1) the only source which included data on adults 18 years of age and older (the population eligible for our sweepstakes) across all geographies studied, and 2) the most complete data source (data from the Philadelphia Department of Public Health does not include Philadelphia residents who were vaccinated outside of Philadelphia or within Philadelphia at Federal vaccination sites).

To assess the robustness of our results, we re-ran our main analyses comparing Philadelphia County to surrounding counties and Allegheny County using available data from the Philadelphia Department of Public Health (2) to source first-dose vaccinations for Philadelphia, and our original CDC data source for first-dose vaccinations for the three surrounding counties and Allegheny County¹. Our residential data source remained the American Community Survey (3), and our model remained the same as in our main analysis: an ordinary least squares (OLS) regression predicting weekly first dose vaccinations per 100,000 adults by county with fixed effects for county, fixed effects for week, and an indicator variable that took on a value of 1 for Philadelphia during the six weeks of the sweepstakes (June 7 through July 19, 2021). When calculating standard errors, we again run each model three times and report the

¹ For clarity, the Philadelphia Department of Health did not have equivalent data on the three surrounding counties.

maximum standard errors produced when clustering by week, clustering by region (county in this case), and using simple robust standard errors.

As shown in Table S1, over the course of the six-week sweepstakes, we estimate that the first-dose vaccination rate in Philadelphia county rose an insignificant 350 vaccinations per 100,000 people compared to adjacent counties of Bucks, Delaware, and Montgomery (95% CI: [-144; 845], $p=0.151$). When comparing Philadelphia to Allegheny, there was an insignificant decrease of first-dose vaccinations of 149 per 100,000 people (95% CI: [-823; 524], $p=0.642$). Figure S1, Panels A through D visualize and compare the vaccination rates in these geographies over time and show that Philadelphia's vaccination rates were already climbing relative to surrounding counties prior to the Sweepstakes, while there were relatively parallel trends in vaccination rates between Philadelphia and Allegheny prior to the Sweepstakes.

ADDITIONAL CALCULATIONS BEHIND COUNTY AND ZIP CODE DIFFERENCE-IN-DIFFERENCE MODELS

As described in the main text, in an attempt to be conservative in how we estimate standard errors, we ran each differences-in-differences model that we describe in the manuscript three times -- once clustering by region (county or zip code), once clustering by week, and once using robust standard errors. We then reported the maximum standard errors produced by these three different models. Table S2 reports the results of all three model variants in our difference-in-differences analyses of the impact of the Philly Vax Sweepstakes on Philadelphia County. Table S3 reports the results of all three model variants in our difference-in-differences analyses of the impact of randomly selecting certain zip codes for "treatment" with increased odds of winning the sweepstakes.

BACKGROUND ON HOW THE PHILLY VAX SWEEPSTAKES WAS ADVERTISED

Each two-week lottery was accompanied by varying levels of marketing at the county and zip code levels. These are detailed below.

On the first day of each two-week lottery (June 7, June 21, and July 6), the next treatment zip code was publicly announced and the terms of the lottery were broadcast through a range of media channels. The first announcement was accompanied by an online press conference (4), a dedicated press release by the Mayor's Office (5), a subsequent press release by the University of Pennsylvania (6), and coverage by major local news outlets including the *Philadelphia Inquirer* (7), NBC10 (8), FOX29 (9), and 6ABC (10). Ultimately, 34 news outlets published original stories about the sweepstakes (11-67).

Also, on June 7, the City of Philadelphia sent out emergency text messages to residents who had signed up for the ReadyPhiladelphia emergency information notification system (N=81,000) to ensure they had heard of the sweepstakes. A second text message went out through the emergency notification system on June 29, to remind residents of the soon-to-close sweepstakes. The City of Philadelphia also posted on Nextdoor, a hyperlocal social networking service, throughout the six week period (June 9, June 17, June 26, July 1, and July 7) to advertise each two-week lottery.

Philadelphia-wide marketing efforts increased during the second and third lottery periods, but media coverage waned (see Figure S2). The second and third announcements of treatment zip codes were made only on the Philly Vax Sweepstakes website, as an item in a regularly-issued press release from the Mayor's office (68-69) and on social media. Additionally, on June 25, during the second two-week lottery period, one of the grand prize winners of the first

lottery who elected to be named was announced and participated in a press conference that was picked up by other media sources (70-71). This press conference was held at a clinic in the second treatment zip code (19133) in an effort to build awareness of the lottery among residents of that neighborhood (70). On July 15, during the third two-week lottery period, the Philadelphia Department of Public Health put out a press release with quotes from the second lottery's grand prize winners. Neither wished to be named publicly (72). The Black Doctors COVID Consortium organized at least 42 vaccination clinics during the six week sweepstakes, and residents visiting the clinics were informed of the sweepstakes (73).

An additional influx of marketing took place during the final two-week lottery period. On July 12th, 2021, Penn Medicine sent out emails about the sweepstakes to all of their Philadelphia-based patients. On July 16th, Penn Medicine sent text messages to all residents of Philadelphia they had vaccinated at their pop-up clinics reminding them of the sweepstakes and asking them to tell others about it. Finally, two prominent local radio stations, Power 99 and Hip-Hop 103.9, featured brief ads throughout the week to promote the sweepstakes from Monday, July 12th to Sunday, July 18th 2021 (74-75).

To ensure residents in the treatment zip codes were aware of their status, several local organizations helped spread the word. During the second and third lottery periods, the City of Philadelphia set up automated calls to residents in each treatment zip code to notify them about the sweepstakes. On June 30th, 2021, 10,045 residents of 19133 were called and 3,796 were reached. On July 12th, 2021, 12,466 residents of 19142 were called and 7,831 were reached.

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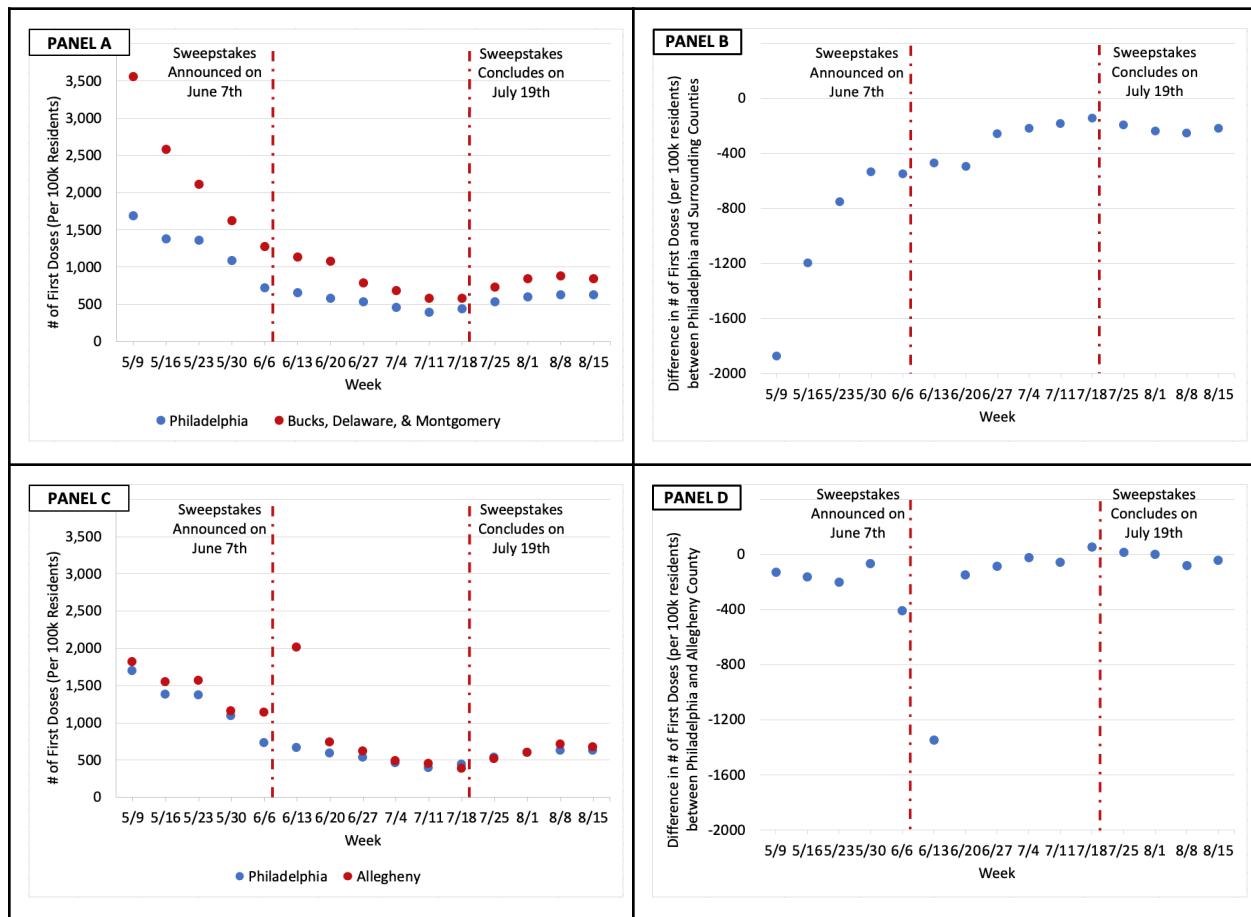
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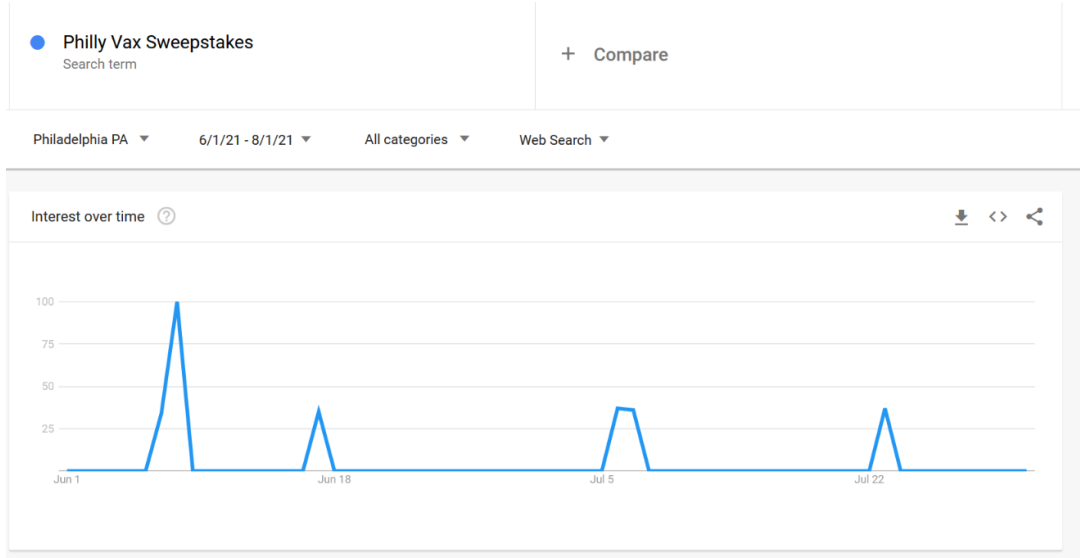
FIGURES

Fig. S1. Panels on the left present weekly average first-dose vaccinations per 100,000 people for adult Philadelphia County residents versus adult residents of comparison counties (Bucks, Delaware, and Montgomery County residents pooled in Panel A, and Allegheny County residents in Panel C) using data from the Philadelphia Department of Public Health for Philadelphia and CDC data for comparison counties. Panels on the right present the difference in weekly first-dose adult vaccinations per 100,000 people between adult Philadelphia County residents and adult residents of comparison counties (Bucks, Delaware and Montgomery County residents pooled in Panel B, and Allegheny County residents in Panel D).



Note. Weekly data is plotted on the last day of a given week (e.g., data for the week 5/31-6/6 is plotted on 6/6).

Fig. S2. Google trends search volume for the “Philly Vax Sweepstakes” from June 1, 2021 to August 1, 2021.



TABLES

Table S1. Impact of the Philly Vax Sweepstakes on Weekly First-Dose COVID-19 Vaccinations per 100,000 people in Philadelphia County (Compared with Surrounding Counties and Allegheny) using Philadelphia Department of Public Health data for Philadelphia, and CDC data for control counties.

	Model 1	Model 2
Philly During Treatment Period vs Surrounding Counties	350 (231)	
Philly During Treatment Period vs Allegheny		-149 (314)
Observations	60	30
R-squared	0.92	0.88
No. of clusters	15	15
Weeks Absorbed	15	15

Note. This table reports difference-in-differences models relying on an ordinary least squares regression to predict a county's weekly first dose COVID-19 vaccination rate per 100,000 adult residents. The predictor variables include county fixed effects, week fixed effects, and an indicator that takes on a value of 1 after the Philly Vax Sweepstakes was announced on June 7, 2021 until the Philly Vax Sweepstakes concluded on July 19, 2021, and 0 otherwise. To be conservative, standard errors have been clustered by week (rather than by zip code or robustly estimated without clustering) since this yields the highest standard errors. All standard errors are reported in parentheses. +p<0.10; *p<0.05; **p<0.01; ***p<0.001.

Table S2. Impact of the Philly Vax Sweepstakes on Weekly First-Dose COVID-19 Vaccinations per 100,000 People in Philadelphia County (Compared with Surrounding Counties and Allegheny County), Calculating Standard Errors in Three Different Ways (Clustered by County, Clustered by Week, and Robust).

	Model 1			Model 2		
	County Cluster	Week Cluster	Robust	County Cluster	Week Cluster	Robust
Philly During Treatment Period vs Surrounding Counties	383* (79.4)	383 ⁺ (203.0)	383* (157.3)			
Philly During Treatment Period vs Allegheny				-116*** (0.0)	-116 (365.1)	-116 (253.7)
Observations	60	60	60	30	30	30
R-squared	0.94	0.94	0.94	0.87	0.87	0.87
No. of clusters	4	15	0	2	15	0
Weeks Absorbed	15	15	15	15	15	15

Note. This table reports six difference-in-differences analyses relying on ordinary least squares regression to predict a county’s weekly first-dose COVID-19 vaccinations per 100,000 adult residents. The first set of three regressions (labeled Model 1) compare Philadelphia to its three surrounding counties while the second set of three regressions (labeled Model 2) compare Philadelphia to Allegheny County. In all regressions, the predictor variables include county fixed effects, week fixed effects, and an indicator that takes on a value of 1 after the Philly Vax Sweepstakes was announced on June 7, 2021 until the Philly Vax Sweepstakes concluded on July 19, 2021, and 0 otherwise. To be conservative, for each model we calculated standard errors in three ways: clustering standard errors by county, clustering standard errors by week, and calculating robust standard errors without clustering. In our main analysis we report the standard errors from the regression that yielded the highest standard errors, which involved standard errors clustered by week for both Model 1 and 2. All standard errors are reported in parentheses. ⁺p<0.10; *p<0.05; **p<0.01; ***p<0.001.

Table S3. Impact of Being Selected as a Treatment Zip Code in the Philly Vax Sweepstakes on Weekly First-Dose COVID-19 Vaccinations per 100,000 People, Calculating Standard Errors in Three Different Ways (Clustered by Zip Code, Clustered by Week, and Robust).

	Model 1			Model 2			Model 3			Model 4		
	ZIP Cluster	Week Cluster	Robust	ZIP Cluster	Week Cluster	Robust	ZIP Cluster	Week Cluster	Robust	ZIP Cluster	Week Cluster	Robust
Treatment Zip Code #1 During Treatment (19126)	61** (20.0)	61 (38.0)	61 (38.7)									
Treatment Zip Code #2 During Treatment (19133)				19 (17.1)	19 (48.4)	19 (47.0)						
Treatment Zip Code #3 During Treatment (19142)							-102** (34.9)	-102 (66.4)	-102 (65.0)			
Treatment Zip Codes During Treatment (Pooled)										-4 (40.3)	-4 (44.5)	-4 (38.1)
Treatment Zip Evaluated		19126			19133			19142		3 Zips Pooled		
Observations	270	270	270	270	270	270	270	270	270	300	300	300
R-squared	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
No. of clusters	18	15	0	18	15	0	18	15	0	20	15	0
Weeks Absorbed	15	15	15	15	15	15	15	15	15	15	15	15

Note. This table reports 12 difference-in-differences analyses relying on ordinary least squares regression to predict a zip code’s weekly first-dose COVID-19 vaccinations per 100,000 adult residents. The first set of three regressions (labeled Model 1) examine the first treated zip code, the second set of three regressions (labeled Model 2) examine the second treated zip code, the third set of three regressions (labeled Model 3) examines the third treated zip code, and the fourth set of three regressions (labeled Model 4) examine the pooled effects of being a treatment zip code. In all regressions, the predictor variables include zip code fixed effects, week fixed effects, and an indicator that takes on a value of 1 in the weeks after a treatment zip code of interest was eligible for rewards and 0 otherwise. To be conservative, for each model we calculated standard errors in three ways: clustering standard errors by zip code, clustering standard errors by week, and calculating robust standard errors without clustering. In our main analysis we report the standard errors from the regression that yielded the highest standard errors, which involved standard errors clustered by week for Models 1, 3, and 4, and robust standard errors for Model 2. All standard errors are reported in parentheses. +p<0.10; *p<0.05; **p<0.01; ***p<0.001.